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ABSTRACT

The paper describes an instructional program that teaches basic decoding skills to learning disabled children, presents the rationale for its development, and offers results of field trials designed to evaluate its effectiveness. The program "ABD's (analysis, blending, decoding) of Reading," initially focuses on auditory tasks and the instructional sequence represents the outcome of a task analysis. The program teaches auditory analysis and auditory blending in isolation at the beginning because of the special value of these skills to the learning disabled child. Among results of a first year field test with 51 learning disabled children were that children who participated in the program performed significantly better than the control group, that teachers were able to work with the program, and that students' attention was easily held by program materials. Results of the second year field test with 24 experimental and 16 control Ss showed significant differences between the two groups on all of the posttests administered except the phoneme analysis subtest. (PHR)

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Final Report

Project No. 443CH604112
Grant No. G007407871

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THE DEVELOPMENT OF INSTRUCTIONAL TECHNIQUES FOR BEGINNING READING SUITABLE FOR LEARNING-DISABLED CHILDREN

October 1979

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ABSTRACT

The ABD's of Reading, a program that teaches basic decoding skills, was developed for use with learning-disabled children. The program provides explicit training in phoneme analysis and phoneme blending; then letter-sound correspondences are presented, and finally, decoding training is given. The program was developed to serve as a supplement to whatever reading program is used in the classroom. Recent research indicating the importance of phoneme skills in beginning reading provides rationale for the program. Two years of program evaluation in New York City classrooms for learning-disabled children are described; the results indicate that the program successfully teaches general decoding strategies. That is, instructed children were able to decode novel combinations of letters as well as words on which they had been trained. No extensive teacher-training, teacher-aides or other unusual classroom support was required. Given mastery of these skills, it is expected that children will be able to succeed in any one of a number of recently-developed comprehensive reading programs. The work that was done addresses questions of current research interest and describes a process whereby basic educational research can be translated into useable school materials.

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U.S. DEPARTMENT OF
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Office of Education
National Center for Educational Research and Development

PREFACE

A large project such as this one cannot be successfully completed without the help of many people. I would like to express my great appreciation to the New York City Board of Education for its generous cooperation and to all the teachers, administrators and children who participated in the study. I am especially grateful to Dina Ehrlich and Sidney Goldstein. I am also grateful to the following people who participated in the development and/or evaluation of the program: Christine Ansell, Sallie Baldwin, Angela Foote, Marc Gold, Chet Gottfried, Barbara Higgins, Meredith Kattke, Nancy Kozak, Mary Oestereicher, Mary Stavrou, Norma Tan, Nancy Westcott, Suzanne Wiener. Nancy Kozak contributed a great deal to the organization of the program and wrote the Unit Stories and many of the games. I also want to thank John S. deCani for help with the statistical analysis.

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INTRODUCTION

The purpose of this paper is to describe an instructional program that teaches basic decoding skills to learning-disabled children, to present the rationale for its development, and to present results of field trails designed to evaluate its effectiveness. The project was undertaken primarily to develop and evaluate the materials themselves. The work that was done addresses questions of current research interest and describes a process whereby basic educational research can be translated into useable school materials.

The instructional program was developed to serve as a supplement to whatever reading program is used in the classroom, and it will probably be most useful in remedial instruction. The name of the program, The ABDs of Reading, refers to the skills taught: analysis, blending and decoding.

Overview:

The first part of The ABD's of Reading focuses solely on auditory tasks. Children learn to analyze syllables and short words into phonemes and then to blend phonemes into syllables and words. Only after proficiency in these tasks is reached are letters introduced, first in the context of individual letter-sound correspondence. Then, decoding is taught.

This instructional sequence represents the outcome of a task analysis. In this approach, the final criterion task is analyzed into simpler component skills, which are then taught

both separately and in integration with other component skills before the complex criterion skill is presented (Gagné, 1974; Glaser, 1977). The basic psychological processes--attention, memory, and so on--that are involved in the mastery of the tasks must also be identified and considered in the instructional design (Resnick and Beck, 1976). Because this approach is well-documented and rather widely accepted at the present time, it needs no discussion here.

One major difference between this program and other programs that teach beginning decoding skills is that, at the very beginning of instruction, certain components tasks are introduced that are not usually taught in isolation: auditory analysis and auditory blending. Classroom observation and a review of the literature led us to the conclusion that a sharper focus on these particular auditory skills than provided elsewhere would be of value to the learning disabled child--a population not often considered explicitly until recently.

It should be noted that our goal is to develop a product that will be useful in the normal school situation. Classes of learning-disabled children usually contain fewer pupils than do regular classrooms; but this still means at least eight or ten children per class, and these are children who are hyperactive, distractible, or otherwise difficult to manage. They are not often able to work independently. Many

learning-disabled classrooms are staffed by a teacher and a teacher's aide, but one cannot count on this; recent budget cuts have resulted in the elimination of many aides. Because we were concerned about cost-effectiveness, we decided not to work toward individualized instruction, even though that is highly effective. We chose to develop materials suitable for small group instruction. Much of the instruction in learning-disabled classrooms is of that type, and it appears to work well in terms of both instruction and classroom management. We did not assume the availability of an aide to help instruct. We also have kept the materials themselves as inexpensive as possible consonant with actual instructional requirements. For example, color cues are not used because full color production is so expensive.

We had another aim in addition to achieving cost-effectiveness; to develop a set of materials that teachers would accept and use. We rejected the necessity of any extensive "selling" of a point of view or even extensive teacher-training procedures. We also rejected the notion that teachers should spend a large amount of time preparing lessons. No matter how enthusiastic teachers may be about an instructional approach, they simply do not have the time to do elaborate preparation for class.

We have developed a program which is complete and self-contained. Teachers can pick it up at the place where they left off and continue without previous preparation. Moreover, while a teacher is working with a small group of children, he/she should concentrate totally on his/her instruction. Thus we provide word lists, examples, etc. so that the teacher is not distracted from the performance of his/her pupils.

The goal, then, is not to develop a program that is effective during development and evaluation when there is a large amount of support (funds and trained personnel) available. Rather, our goal is to develop a program that can stand by itself, without such resources, for in the normal school situation there are no such supports.

The Learning-Disabled Child

There are many children who cannot make progress in a regular school situation even though they presumably have the intellectual capacity to do so. Nor do they have physical handicaps, emotional problems, or sensory loss; nor have they suffered any educational or cultural deprivation. In other words, they appear to have potential for achievement but nevertheless do not demonstrate adequate achievement. Until only recently, such children were often characterized in terms of "brain-injury" or "minimal cerebral dysfunction." The notion that the difficulty was due to some sort of damage to the central nervous system (Strauss and Lehtinen, 1947) rarely could be corroborated with actual evidence of neurological impairment. The newer term "learning-disabled" acknowledges the fact that we do not know the reason for these children's difficulties.

These children may demonstrate any of a wide variety of problems. They may show poor performance in several school subjects, or they may

demonstrate more specific disability in only one area, such as reading. Their aptitude test scores are likely to show uneven performance among subtests with a substantial difference between verbal and performance abilities. They may be impaired in one or several of the following areas: perception, conceptualization, language, memory and control of attention, impulse, or motor function (Hallahan and Kauffman, 1976). Ross (1976) considers that a basic problem shared by many, if not all, learning-disabled children is a difficulty in sustaining selective attention. It is this difficulty, he claims, that leads to other problems characteristic of this type of child—perseveration, distractibility, and poor memory, which in turn lead to inadequate school performance.

Although not all learning-disabled children have trouble learning to read, this area does represent an important source of difficulty for many of them. Disabled readers are themselves not easily categorized; they may have difficulty in any or all of the areas on which reading is based. They may exhibit disorders in visual and auditory discrimination, or memory and sequencing, as well as in the integration of auditory and visual perception (Samuels, 1973). Vellutino (1974) has discussed the myriad patterns of error on reading tasks that occur: reversals and transpositions, adding or dropping of phonemes or syllables, substituting one word for another with a similar meaning, confusing similar letter sounds, and/or inability to blend and analyze word parts. These are the same mistakes, or course, that any beginning reader might make; but the normally achieving child eventually ceases to make them, whereas the disabled reader persists.

It is certainly unrealistic to expect that one particular teaching approach or one specific set of instructional materials will be maximally

effective with the wide variety of children classified as "learning-disabled" or even as "reading-disabled." It seems likely that some further differentiation of types of children within this overall classification will have to be made before we can confidently make judgments about the specific educational approach to take with an individual child. Indeed, a great deal of research has been done with just this goal in mind. Not too much progress has been made, unfortunately. It is not easy to find instances in which one instructional method is superior to another for one group of children and a second is superior to the first for another group of children (Cronbach and Snow, 1977).

Most of the search for such disordinal interactions in the area of reading instruction has focused on the issue of modality. That is, attempts have been made to characterize children as either "eye oriented" (they have trouble with tasks involving auditory analysis) or "ear oriented" (they have trouble with visual perceptual tasks). Wepman (1968), for example, proposed that all early learning is modality-bound and that some children have a discrepancy in the ease with which they can process and store information received through the eyes and ears. There is, however, no sound empirical foundation for the notion that different reading approaches are differentially effective for children characterized in these ways. Most studies have compared some variety of whole word approach, which requires little analysis of sounds, with a phonics approach. Neither classroom studies (Bateman, 1968; Robinson, 1972) nor laboratory analogues (Bruinicks, 1970; Ringler and Smith, 1973) have come up with convincing findings. It should also be pointed out that in these studies children identified as visiles and audiles together comprise only about 15-20% of the sample.

It would probably be unwise to argue that matching instructional treatment to diagnostic category will never be shown to enhance learning. It may even be true that there are special methods of teaching reading which will work most effectively with specific types of children. But we have no evidence now, and to develop curriculum materials with such a focus at the present time is not reasonable.

The Program Rationale

Slow learners, including the learning-disabled, need simple, clear, and direct instruction. They do well with a structured approach, and the material should be presented at a slow pace with each step made carefully explicit and with sufficient opportunity for practice. They should be active participants in the instructional process, and ample feedback should be provided about their performance. They should be kept motivated to achieve. These general principles need not be defended here (although I will say, parenthetically, that the effective implementation of these principles is not always easy).

Decoding is the central task of beginning reading instruction. It consists of learning the fundamental relationships between spoken language and written language, i.e., the mapping of the grapheme-phoneme correspondences. The ability to decode, then, implies both the ability to isolate the phonemes that make up a word and the ability to blend individual phonemes into whole words. The development of these abilities requires the use of complex conceptual strategies (Vernon, 1957; Resnick and Beck, 1976).

In the whole-word (sight) method of instruction, and to some extent in linguistics methods, there is no direct instruction in analysis of a word or word part into its component sounds. Not all children can do this

inductive analysis on their own; some children will succeed with this type of instruction while others will not. Those who do not succeed often do not make much progress in reading, because for them, this sort of instruction requires rote-learning of a large number of specific words and letter patterns, and there is, after all, a limit to one's rote memory. Moreover, Liberman et al. (1976) have shown that the acoustic characteristics of a phoneme are modified by the other phonemes in a word or syllable and that the cues for recognizing the phonemes in word occur simultaneously as well as sequentially. Thus, the component sounds of a word as we sound it out (e.g., "c-a-t") are not actually segments of the spoken word; blending is an abstraction. For these reasons, the desirability of giving direct, explicit instruction in analysis and blending to the learning-disabled child seemed obvious to us.

It is clear that progress in beginning reading is related to proficiency in those auditory skills that can be identified as components of the decoding process. Much of the literature is based on correlational evidence, to be sure. Monroe (1932), for example, found significant differences between children with reading disabilities and younger controls in both auditory discrimination and the acquisition of auditory-visual associations. Relationships between a variety of auditory tasks and reading readiness or first and second grade reading achievement have been demonstrated over and over again (e.g., Harrington and Durrell, 1955; Dykstra, 1966). More recently, the importance of the specific abilities of blending and segmentation has also been emphasized (Elkonin, 1963; MacGinitie, 1967). Substantial correlations have been found between these tasks and either concurrent or later reading achievement (e.g., by Chall, Roswell, and Blumenthal, 1963; Calfee, Lindamood, and Lindamood, 1973; Liberman, 1973).

Moreover, there have been several studies showing that training in auditory skills may have positive effects on reading. Durrell and Murphy (1953), evaluating the results of eleven studies, concluded that training children to notice sounds in words improved their reading scores. Children whose initial scores were very low made the greatest progress. This training, incidentally, consisted only of identification of initial consonants and of rhymes. Elkonin (1963) taught kindergarten children to identify sounds in words by using counters to represent each phoneme. Rosner's (1973, 1974) instructional program, which develops word analysis skills to a high level of proficiency, shows some transfer of these skills to the reading task. Wallach and Wallach (1976) also have developed a beginning reading program that incorporates auditory analysis training. This program was designed to be administered in a one-to-one tutorial setting (unlike the work reported here), and has shown promise with low-readiness first-graders.

Since our work on this program began, more and more studies have corroborated this point of view. Goldstein (1976) found that kindergartners' segmentation ability predicted reading achievement one year later; he concluded that reading instruction was much less effective if a child's ability in sound analysis and synthesis was very low. Fox and Routh (1976) found that phonic blending training was effective only if children were already proficient in phonic analysis. (However, it is possible that the children who at the beginning of the study were superior in ability to analyze words into phonemes were generally more able students.)

All of this evidence suggested that a highly structured program with emphasis on the development of auditory skills would prove successful. Underlying this was the fact that auditory deficits do seem to be more characteristic of learning-disabled children than are visual or intersnesory problems (Zigmond, 1969)--difficulties in auditory discrimination, memory, sequencing ability, and, especially, analysis and synthesis.

For most children, it would not be necessary to introduce the segmentation and blending tasks as purely auditory tasks; letters could be introduced at the same time. But we introduced them separately in order to simplify the task; we considered this important for learning-disabled children. Many learning-disabled children have failed to learn to read simply because they cannot handle the complexity of the task as it is usually presented. That is, they suffer from "sensory overload." Or they may have failed simply because of the lack of explicit emphasis on the auditory components of the task and extensive enough practice on these skills.

Several points should be noted here. First, all of the studies that I have cited are concerned with auditory tasks that involve language and that are therefore closely related to reading. Second, the literature is convincing on the specificity of transfer and the dangers of relying on transfer in instruction (Williams, 1965; Gage and Berliner, 1975). Third, the results of the formerly popular visual-perception-motor reading-readiness programs (e.g., Kephart, 1960; and Frostig and Horne, 1964) have turned out to be very disappointing. These facts should serve as a clear warning that "auditory perceptual training" in and of itself will not improve reading achievement (the plethora of recently and hastily developed programs of this type notwithstanding). It is the emphasis on effective presentation of the auditory components of the reading task itself that is important.

Of course, the "need" for a particular instructional approach and the demand for it are not determined solely by evidence from research. The Zeitgeist has to be right. The field of linguistics has had a major impact on educational thinking over the last decade or two, and the con-

sequent reaffirmation of the idea that "reading is a language skill" has helped to foster the current emphasis on auditory skills in beginning reading. In addition, because of the recent acknowledgment of the ineffectiveness of visual-perceptual training, the focus of many of the standard reading readiness and remedial reading methods (Williams, 1977), people have been clamoring for something new and different. It is interesting to note that in her classic book, Backwardness in Reading, Vernon (1957) stressed the need for analysis of both the visual and auditory structures of words; and yet for almost twenty years most of the references to her work document the need for visual analysis and ignore the need in the auditory modality.

Description of the Program

Introduction: In a short introductory section of the program, the child learns the concept of analysis, that is, that words can be broken down into parts. Both compound words and multisyllabic words are presented. At the end of this sequence, the child can analyze at the syllable level. That is, he/she can tell what syllable occupies the initial, medial, and final positions in a whole word. This is a much easier task than that of segmenting into phonemes (Liberman, Shankweiler, Fischer, and Carter, 1974; Hardy, Stennett, and Smythe, 1973). Indeed, it is an extremely simple task, and this introductory section moves very quickly. In addition to demonstrating the concept of analysis, there is a second reason for beginning the program with this material. Because the sequencing of sounds is a temporal phenomenon, it is wise (Elkonin, 1963; Kuenne and Williams, 1973) to provide some sort of visual "marker." Moveable wooden squares, which provide tactile and visual representation of sounds, are used to facilitate auditory analysis and synthesis. The child learns

to identify auditorially first, middle, and last syllables (or word parts) and to associate them visually with markers. Thus this visual representation is introduced on a task that represents very little challenge to the child and is therefore accomplished easily.

Phoneme Analysis: In this section of the program, phoneme analysis is taught, again as a strictly auditory task. The squares now represent phonemes and aid in focusing on the number and the order of sounds, which has been found to be a difficult task for children (Calfee, Lindamood, and Lindamood, 1973). Combinations of two phonemes are presented first, followed by combinations of three phonemes, both real words and nonsense syllables.

All of this auditory analysis and sequencing practice is done with a limited number of phonemes. In choosing the initial set of nine phonemes (and therefore, later in the program, letters), we considered the following factors: (1) avoidance of auditory confusability, (2) avoidance of visual confusability, (3) ease of blendability of the phonemes in combination, (4) productivity of phonemes in creating real-word trigrams, (5) ability of children to produce sounds, (6) ease of learning grapheme-phoneme association, and (7) regularity of phonemes in spelling patterns. Each of the seven considerations suggested a different set of "most appropriate letters," so compromises had to be made on some points. Because of the program's emphasis on auditory skills, we decided that visual considerations would be of relatively low priority and that avoiding auditory confusability would be our highest priority.

The short vowels (a and o) were selected because of their adherence to regular spelling rules in consonant-vowel-consonant (CVC) trigrams and secondarily because of their productivity. Long vowels, while more

easily discriminable and blendable (Coleman, 1970), were ruled out because of the irregularity of long vowel spelling patterns in English. The selection of consonants proved to be at least as difficult as that of vowels. Miller and Nicely (1955) divided consonant phonemes into four basic groups; within each one there is considerable potential for confusion in discrimination whereas between groups there is little. Thus, for ease of discrimination, we chose one consonant from within each group, the one which best satisfied the requirements of (1) production of many real word trigrams and (2) children's ability to produce the sound without error (Marsh and Sherman, 1971). The ease of sound-symbol association learning (Coleman, 1970) was also considered, and the letters chosen were acceptable in this respect. On this basis the initial set consisted of b, m, p, and s. Then in violation of several considerations, but in order to provide enough real-word trigrams for meaningful instruction, the letters c, g, and t were added. Thus the nine letters are a, o, b, m, p, s, c, g, and t.

The use of only a small number of phonemes that are chosen for maximum discriminability means that if a child moves ahead rapidly in analysis and synthesis and yet finds auditory discrimination difficult, he can still proceed in the program. Furthermore, the program may well improve his discrimination abilities as a side-effect, because it works to increase attention to detail.

Phoneme Blending: The next section of the program presents blending of the same two-phoneme and three-phoneme (all CVC) units. The CVCs are broken at different points. Initially, only the last phoneme is separated from the rest of the word. Next, only the first phoneme is separated from the rest of the word, and later all three phonemes are presented separately. This sequence is based on work by Coleman (1970).

Letter-Sound Correspondences: After the basic instructional sequence on auditory analysis and synthesis, there is a section that teaches the letter-sound correspondences for the nine phonemes. Thus children will be thoroughly familiar with the correspondences they will need for the initial decoding section before they get to that point in the program.

Decoding: The next section of the program pulls together the auditory skills and the letter-phoneme correspondences that the child has been practicing. Here he must integrate the skills he has learned in isolation. Again using wooden squares, which now have letters on them, the child learns to decode bigrams and trigrams (both meaningful words and nonsense syllables), made up of the same nine letters with which he has already become familiar. He receives extensive practice in the manipulation of these letters so that he can decode (read) and construct from letter squares (spell) all the possible CVC combinations. Through this extensive practice with limited content, the child learns to attend to the details required for accurate decoding, and he also learns the fundamental processes and strategies that will enable him to apply decoding skills to other content.

Further Instruction: In the next section of the program, six additional letter-sound correspondences (f, h, i, l, n, and r) are introduced. Then these are used in trigram decoding. Following this, all fifteen letters are combined and recombined for additional decoding practice.

The final section of the program introduces, one by one, more complex units for decoding. First, CCVC patterns are decoded, followed by CVCC and then CCVCC patterns. Finally, two-syllable words made up of the same basic patterns are presented.

Organization of the Program

The instruction outlined above is organized into twelve units and a total of 41 objectives. Each unit begins with a story, to be read by the teacher. This story is designed to capture the children's interest, and it incorporates a demonstration of the skills to be mastered in the unit. For example, a child must guess the "magic word" which unlocks a secret door when the magician says the word broken into phonemes. The same cast of characters—Isabel, whose nickname is Wisebell because she is a little "know-it-all," along with her friends, Tom and Mac, and Sam, the janitor—appears throughout the program in stories and games and provides a continuing theme and focus of interest.

Following this story, a teaching procedure is presented for each objective. This consists of a complete and very explicit script for the teacher along with as many appropriate examples as will be needed. The instruction always follows the same format: first, the teacher demonstrates the task by modelling one example. Then he or she calls on an individual pupil, models another example, and has the child copy him/her. Then he/she presents another example which a child must do independently. Errors are corrected by the teacher's providing the proper response and then having the child repeat it immediately afterwards.

Each unit also contains a variety of materials for practice. At least one game is provided for practice on each objective. The games are simple, and there are only a few different game formats, of the sort (Go Fish, Concentration, etc.) that most children recognize. Their content varies, however. In one game, children must collect three cards, each of which represents a different after-the-movie snack; in another, three different bicycle parts. This type of variation is enough to make each game

accepted as novel and interesting. Games can be played either competitively or not.

In addition, two worksheets are provided in each objective. As with the games, some of the worksheets were designed to be completed under the supervision of the teacher and others to be done independently. In actuality, however, the use of all program materials is directed by the teacher.

All of the activities are designed to provide small groups of children with the opportunity for extensive practice of skills in a variety of contexts. They also provide for continuity and interest, in that they are based on the theme of the story presented at the beginning of the unit.

Comprehension

This is a decoding program, not a complete reading program. But it is important that pupils be able to apply their decoding skills in the context of actual reading. To ensure this, the teacher provides a meaningful context for words immediately after they have been decoded (or blended, earlier in the program); he/she uses the word in a sentence or identifies it as a nonsense word. In addition, simple comprehension activities are provided. For example, in the second half of the program there are several "stories," each consisting of a series of four pictures with one or two short sentences under each picture.

A few simple words that are not easily decodable, like is, to, and of, are necessary for these comprehension activities. When the program is used remedially, it is possible that some children have enough of a sight-word vocabulary so that they can read this material on their own. In other cases, of course, this is not true, and the teacher and the

pupil read the sentences together, the teacher supplying the words which do not lend themselves to a decoding strategy.

Individual Differences

It is obvious that individual differences exist in the degree to which some of these abilities are deficient and in the amount of training that will be required. The program is designed to be maximally flexible in dealing with these differences. For example, the letter-sound unit may be begun early or late; and it, or any of the units, may be extended for whatever length of time is required to attain competence. Some children may prefer competitive games, and others may achieve more readily with individual activities. Worksheets appeal to some children (and teachers) and are of very low interest to others. The variety of materials that is provided allows options, and the teachers (and, when feasible, the children) can choose the most effective combination of alternatives.

METHODS

An extensive evaluation of The ABD's of Reading was performed. It included two assessments of the complete program in the field. These assessments were conducted after the preliminary stages of development had been concluded; in these preliminary stages, portions of the program were administered to small groups of children or to one child at a time, both by staff members and by classroom teachers.

The children were pupils in Health Conservation (HC-30) classrooms, which are administered by the New York City Board of Education's Bureau for the Education of the Physically Handicapped. All children in these classrooms are officially considered learning-disabled. (It might be argued that the particular population studied here is not strictly speaking learning-disabled, because the mean IQ is well below "normal". However, given the lack of consensus as to how to define learning-disability and to decide whether a child should be classified as learning-disabled, a common strategy has evolved. It consists simply of working with children who have been identified by the local school authorities as learning-disabled. This is what was done here. The rationale presented in this paper makes it unnecessary to agree that the subjects involved are in fact learning-disabled by any strict definition that a particular theorist might propose.) Any emotional overlay to their disabilities is slight, since children with more severe emotional disturbances are placed in other classes.

Children are assigned to these (or other) special classrooms when they perform unsuccessfully in a regular classroom setting and only after psychological and neurological assessment. All classrooms were in Title I

Manhattan schools, in Central and North Harlem and on the Lower East Side. The ages of the children ranged from seven to twelve.

Because it is difficult to present coherently the methodology of a field evaluation and the results of that evaluation if the two aspects of the study are separated, further explication of the procedures used will be presented where appropriate in the next section.

RESULTS

Year 1. The main focus for the first year's work was on formative questions; we were interested primarily in making further refinements to the program on the basis of observation of actual teachers using the program in their normal classroom setting. Because of this orientation, we invited teachers to work with us who had been recommended as competent and co-operative. A half-day session at Teachers College was held to introduce the teachers to the materials and to describe our plans. In November, 1975, all 157 pupils in 21 classrooms in eight schools were pretested. Eleven children related so poorly to the test situation that the test was not completed; 146 complete pretests were administered. The pretest assessed competence in the specific skills covered in the program: auditory analysis and blending of both syllables and phonemes, letter-sound correspondences, and decoding. Test-retest reliability, based on a sample of 20, was .86. Table 1 presents the mean number of correct responses for all subjects.

On the basis of the pretest scores, we selected those children who were likely to profit from the program. Our focus was on choosing the (approximately) four children from each classroom who would most benefit. No specific cut-off scores were used; selection was based on a child's decoding score and his ability to blend and analyze on the phoneme level.

Seventeen instructional groups were formed. Sixty-three children were involved: 11 groups of 4 students, four groups of 3, one group of 2, and one group of 5. In consultation with the teachers, we found that in almost every case we had chosen the same children whom the teacher had had in mind for the program.

The pretest was also administered to another group of HC-30 children in

comparable school districts within Manhattan. Starting with a total of 178 students in nine schools, and using the same procedure that was used to select the instructional population, we formed 16 groups (64 pupils). This is, of course, not a proper control group, but comparing these children with those who were instructed could provide us with some information about the impact of the program as well as pilot data for the second year's evaluation. There were no significant differences on any of the pretests between the instructed and the comparison subjects. (Appropriate treatment of the data would involve using each instructed group and not the individual subject as the unit of analysis. Because of the loss of data and consequent small-sized and unbalanced groups, this was not done.)

Do children who are not learning and who are making "adequate" progress in regular classrooms demonstrate proficiency in the skills assessed by our pretest? To answer this question, the pretest was administered to 36 children in a regular second-grade classroom in West Harlem.

Table 2 presents means and standard deviations on the pretest for the initial 146 children from which the instructional groups were formed, the children in the instructed groups, the children in the comparison groups, and the second-graders. For ease of communication, certain of the sub-tests have been combined. In the case of all groups, the pattern of results when the scores were broken down as in Table 1 was similar to that of the original 146 subjects. Unfortunately, the pretest data for 12 instructed children and 11 comparison children were lost. The data that are presented here include the fifty-one instructed children whose pretests were available for further analysis and fifty-one of the comparison children whose pretests were available (two subjects in the latter group were dropped randomly in order to equate the Ns in the two groups). A comparison of the pretest scores of these

reduced groups indicated that in one out of ten comparisons (saying the middle phoneme), the groups were significantly different ($F=4.50$, $df=1,100$, $p < .05$); the mean of the comparison children was higher. The second-graders' scores were substantially higher than those of the other groups, and these scores indicated that these children do indeed exhibit ability in these skills.

Teachers were asked to use the program daily for approximately twenty minutes per session. Four teachers were observed every day. This close monitoring of the instruction is especially important when working with learning-disabled children, because their behavior is often extremely erratic. The other thirteen classes were observed and the teachers interviewed once a week. Teachers were asked to work through the program exactly as it was presented, using all the games, worksheets, etc., in order to provide a firm basis for evaluation and possible revision of every component. (This is not necessarily the way the program is actually to be used.)

The regular reading instruction provided in these classrooms might best be described as eclectic. A wide variety of materials was used. All teachers used a basal reading program, a different one in almost every classroom; only one series was used by 3 teachers, and 2 others by 2 teachers each. About 75% of the teachers also used phonics materials, sometimes the phonics component of the basal series and sometimes a separate phonics program.

No teacher dropped out of the study, and only five children dropped out of their classes, and therefore the program, during the year. The pretest was readministered at the end of the academic year as the posttest.

The mean length of instructional session was 29.0 minutes (S.D. = 9.0). Overall, approximately 26 weeks of instruction were given (M = 25.6, S.D. =

3.7). Only three groups were able to complete the entire program before the posttest was administered. The slowest group completed five units. The mean number of units completed was 8.1 (S.D. = 2.2).

Table 3 presents the means and standard deviations of the posttest scores. There was a significant gain from pretest to posttest on all but three subtests in the instructed group (syllable analysis, syllable blending, and saying the final phoneme), t's ranging from 3.13 to 8.06, df = 100. In the comparison group, there was a significant gain from pretest to posttest on 4 subtests (saying the final phoneme, saying all 3 phonemes, phoneme blending, and decoding), t's ranging from 2.07 to 3.22, df=100.

Post-test scores of the instructed group were significantly higher than those of the comparison group of the first letter-sound correspondences subtest, $F(1,100) = 4.64$, $p < .05$; on the second, $F(1,100) = 15.76$, $p < .01$; on saying the middle phoneme, $F(1,100) = 6.82$, $p < .05$; on saying all 3 phonemes, $F(1,100) = 5.73$, $p < .05$; and on decoding, $F(1,100) = 28.62$, $p < .01$. The difference between the groups on the phoneme blending subtest was marginally significant, $F(1,100) = 3.73$, $p < .10$.

The following January, the posttest was administered again to those children in the instructed and the comparison groups who were accessible, i.e., the ones who had not moved out of Manhattan. (Of the 102 children, 66 remained in the same HC-30 classroom with the same teacher for the following year.) Scores for 36 subjects in each group are presented in Table 3 (scores of two additional subjects from the comparison group, chosen randomly, were dropped in order to equate the N). Results indicated that six months after the completion of the program, the scores of the instructed group were still higher than those of the comparison group, but the only difference that was significant was on the saying-final-phoneme subtest, $t(70) = 1.72$, $p < .05$. The difference

on the decoding subtest was marginal: $t(70) = 1.72$, $p < .10$.[2]

The primary purpose of the first year in the field was to determine which aspects of the program seemed to be effective and which ones might be improved through revision. Discussions of the classroom observations at weekly staff meetings led to a consensus that while much of the program was satisfactory as it was, there were also several ways in which it might be improved. Among the general decisions made were: (1) to modify the format of the teacher's manual so that there was a minimum of explanatory material to be read; (2) to reduce greatly the amount of introductory material that dealt with analysis and blending on a syllable level--it simply was not necessary to spend much time on these skills; (3) to provide more games, because both teachers and pupils expressed a great deal of enthusiasm about them; and so forth.

Observation in the classrooms led to favorable evaluation on certain important formative concerns: teachers were able to work with the materials, and they liked to use the program. (Moreover, the amount of time devoted to the program was substantially greater than what we had asked for; and all teachers rated the program high at the end of the year). Also, pupils were able and willing to respond to the instruction. There were no difficulties with understanding the tasks or with holding the pupils' attention.

In addition, the comparison of instructed children with non-instructed children indicated that the program was effective in improving the skills taught and that this improvement was to some extent maintained on a task administered six months after the completion of the instruction. It must be noted that these encouraging outcomes resulted from a field trial conducted under the most favorable conditions: competent, cooperative, volunteer teachers and a large amount of monitoring throughout the year.

Year 2. The second year in the field was devoted to summative evaluation, focussing on the question of program effectiveness. Thanks to unusually generous cooperation from the New York City Bureau for the Education of the Physically Handicapped, we were able to conduct a fairly large experiment. The Bureau identified six districts in New York City (in Brooklyn, the Bronx, and Manhattan--not the same districts in which we had worked the previous year). All HC-30 classrooms within those districts were assigned randomly to an instructional treatment (again, the program as a supplement to the regular classroom instruction) or to a no-treatment control, with the restriction that there would be three experimental classes to every two control classes.

Thus the teachers involved in the experiment were not specifically chosen for participation. Rather, they represented all the teachers in the districts whose classes contained a suitable group of children. Far from being the enthusiastic volunteers of the previous year, their participation in the experiment was mandated.[3]

Using the same procedures as in Year 1, pretests were administered in October and November. Each test tested approximately equal numbers of experimental and control classes and did not know to which group each class had been assigned. Small groups (N=179) were formed on the basis of pretest scores, 24 experimental and 16 control. This time, teachers independently identified the children who would benefit from the program. These judgments were highly correlated with the decisions made on the basis of the pretest scores, $\chi^2(1) = 105.9$, $p < .0001$ (corrected for continuity).

Teachers assigned to the instructional treatment were asked to use the program three or four times per week in the way that was in their opinion most appropriate for their pupils. That is, they might skip certain objectives

or even entire units, eliminate worksheets, games, unit pre- and post-tests, and so forth. They were asked to keep a record (on a form provided) of what activities were undertaken, how much time was spend on the program, pupils' scores on unit tests, etc.

Monitoring consisted of a weekly visit to each classroom to collect these forms and the observation of one lesson in each class every two or three weeks. This low level of interaction with the teachers was aimed at keeping the evaluation as "hands-off" as possible without losing the information we wished to collect.

In late May and early June, the pretest was re-administered as a post-test. Of the 179 children who began the experiment, 164 completed it. This loss of 15 subjects was due to transfers and chronic truants. The analysis this second year was based on the classroom group as the unit of analysis. The number of children in each group was equalized at 3 by randomly dropping subjects from each group. Four experimental and 2 control groups were lost to the analysis at this point because each of them contained fewer than three subjects who completed the experiment. This left a total of 20 experimental groups (N = 60) and 14 control groups (N = 42).

We did not receive permission to administer standardized tests. However, we were allowed to use information in the school records. Even though children had been evaluated extensively before being placed in the HC-30 classes, it turned out to be difficult to find test scores for them. We were able to obtain 42 intelligence test scores (an additional 12 verbal, not quantitative, descriptions of intelligence were available but not used). These scores were based on a wide variety of tests. The mean IQ of the children in the experimental group was 83.52 (SD = 12.0, N = 21) and was not significantly different, $t(40) = 1.01$, from the mean IQ of the control children (M = 80.19, SD = 9.1,

N = 21). We found 47 grade-equivalent reading achievement scores, again based on a large number of tests. The mean of the experimental group was 1.52, SD = .48, N = 22 and was not significantly different, t(45) = .77, from the control group, M = 1.35, SD = .48, N = 25. Mean chronological age as of September 1 for the experimental group was 9.37 years, SD = 1.74; this was not significantly different, t(100) = 1.42, (t = 1.42, df = 100) from the mean for the control group, which was 9.77, SD = 1.22.

The mean number of units of the program completed by the 20 experimental groups was 6.65 (SD = 7.52), the mean number of sessions was 58.20 (SD = 18.32), and the mean number of weeks spent on the program was 18.75 (SD = 4.61). The mean number of children per experimental group was 4.63 (SD = 1.42).

Although the teachers had been urged to use the program in any way they saw fit, only three of the 20 teachers skipped units, and no teacher skipped more than one. The first of the 2 worksheets per objective was used 77% of the time, and the second, 70%; 77% of the games were used--no higher than the percentage of worksheets, although the teachers had reported that both they and the children strongly preferred the games to the worksheets; and 91% of the unit pretests and posttests were administered.

Table 4 presents the means and standard deviations of the pretest scores. The pretest was a modified version of that used in Year 1: there was no syllable task and only one letter-sound correspondence task, and only trigrams were included on the decoding task. There were no significant differences between the experimental and the control groups on any of the subtests.

Correlations were computed for various sections of the pretest across all 34 groups, and they are presented in Table 5. (Each of the sections contained 18 items except for the phoneme analysis section, which contained

24 items.) All r's were significant beyond the .01 level (df = 68). The correlation of phoneme analysis and letter-sound correspondences, both of which required the child to produce individual phonemes as test responses, was significantly higher than any of the other correlations, which did not differ among themselves.

Table 6 presents the posttest data. The performance of the experimental groups improved significantly from pretest to posttest on every subtest (t's ranged from 5.31 to 9.90, df=19, $p < .0001$). The control groups also improved signficantly from pretest to posttest on every subtest but one (t's ranged from 2.35 to 5.63, df=13, $p < .025$); final-phoneme analysis was not significant ($t = 1.26$, df = 13). An analysis of covariance was performed on the post test scores, using pretest score as the covariate. As indicated, the experimental groups scored significantly higher than the control groups on every subtest of the posttest except one phoneme analysis subtest (saying initial phoneme).

Table 7 presents the correlations among total pretest score, total posttest score, number of units of the program completed, and number of teaching sessions for all 34 groups. A multiple regression analysis was performed on the posttest scores with the other 3 variables as independent variables. Pretest score was entered into the regression equation first; the R^2 was .476. When number of units completed was entered next, the multiple R^2 increased to .783. The number of sessions was entered next, and the multiple R^2 was then .799.

Thus, these three factors accounted for 80% of the variance in the posttest scores; the proportion of the explained variance that was accounted for by the linear regression on pretest scores was significant, $F(1,32) = 29.08$, $p < .001$. The proportion increased significantly when number of units was added, $F(1,31) = 43.87$, $p < .001$. It did not increase further when number

of sessions was added into the regression equation, $F(1,30) = 2.47$, indicating that number of sessions did not contribute significantly to the explained variance in posttest scores independent of the contribution of the other two variables.

Similar analyses were performed on each subtest; in each case, the results were comparable to the results reported for the total score.

Transfer of Skills. Evidence that the instructional program was effective in teaching the particular content covered in instruction was, of course, only a first step. An essential second step was to determine whether or not the children could generalize, i.e., demonstrate transfer to content not included in the instruction. Were these subjects able to use their decoding strategies on novel materials?

Several laboratory studies have demonstrated transfer in young children (Silberman & Coulson, 1964; Jeffrey & Samuels, 1967; Jenkins, Baussell, & Jenkins, 1972; Muller, 1972-73, and Carnine, 1977) in experiments designed to evaluate the effectiveness of explicit letter-sound training. In all of these it was found that explicit blending training was necessary if children were to be able to decode new words. In a similar study, Fox and Routh (1976) taught four-year-olds to decode words made up of combinations of phonemes and letter-like forms. Specific training in phoneme blending improved performance on the decoding task only for children already proficient in phoneme analysis. (IQ was not controlled in this study, unfortunately.) None of these studies looked at children whose IQs were as low as those in the present study.

There are few studies to cite that are based on actual classroom instruction, because it is difficult to monitor the instruction carefully enough to be sure that there has been no direct training on the content to be used in

assessing transfer. Becuase of the highly structured nature of this program, it was feasible to incorporate such a control in the training.

In order to do this, the experimental materials were modified in the following way. Certain trigram combinations of letters and/or phonemes, chosen randomly, were eliminated completely, page by page, from the games and worksheets and also from the long lists of "teachable" items in each lesson of the teacher's manual. Without complete monitoring of all lessons in all classrooms, it cannot be proved that a child never encountered in the course of the program those words and nonsense syllables, but it seems reasonable to assume that this was the case on the basis of (1) the classroom observations that were made, and (2) the fact that teachers reported that they had used only the items provided.

When an experimental group reached each of two points in the program, a short test was administered individually to each child in the group. Control groups were chosen at random to provide yoked controls; that is, whenever an experimental group was tested, a control group was identified, and the children in it were given the same test.

The specific question that this procedure was designed to answer was: After being given decoding training on CVC combinations of a limited set of letters, can the child decode new combinations of the same letters?

Test 1 was administered at the end of Unit 7, i.e., after the child had completed training on trigrams composed of 9 letters. The test consisted of 24 items: 12 familiar combinations of the nine letters, on which the child had had training and 12 unfamiliar combinations, on which the child had <u>not</u> had training. Half of the familiar items were real words and half were nonsense words; half of the unfamiliar items were real and half, nonsense. Four randomized orders of presentation of the items were used; an equal number

of subjects received each of the four orders.

Test 2 was administered at the end of Unit 9, i.e., after the child had completed training on trigrams composed of 15 letters. The test consisted of 24 items: 12 familiar and 12 unfamiliar combinations (half of each type being real words and half, nonsense) as in Test 1.

There were 28 Ss in the experimental group and 28 in the control group who completed both tests; these are the data presented. An additional 32 subjects in the experimental group and 32 in the control group completed Test 1 only; these data indicated the same effects as those presented here.

An analysis of variance on the mean number of correct responses was done separately for each test. There were three factors: group (experimental and control); type of item (familiar and unfamiliar); and type of word (real and nonsense). Table 8 presents the mean number correct in all conditions for each test.

On Test 1, the analysis indicated that:

1. The mean number of correct responses was significantly greater for the experimental group (M=4.61) than for the control group (M=1.34), $F(1,54) = 98.06$, $p < .001$.

2. Performance on real words (M = 3.30) was significantly better than performance on nonsense words (M = 2.64), $F(1,54) = 41.39$, $p < .001$.

3. Performance on familiar (trained) words (M = 3.36) was signficantly better than performance on unfamiliar (transfer) words, (M = 2.59), $F(1,54) = 42.13$, $p < .001$.

4. There was no significant interaction between group and type of item, $F(1,54) = .21$.

5. There was a significant interaction between group and type of word, such that there was no difference for the experimental group between real and nonsense words, but for the control group performance on real words was better than that on nonsense words, $F(1,54) = 18.90$, $p < .001$.

6. There was a significant interaction between type of item (degree of familiarity) and type of word, such that on trained items, scores for real words were higher than scores for nonsense words, and on transfer items the difference between real and nonsense words is smaller, $F(1,54) = 9.66$, $p < .01$.

7. This interaction between type of item and type of work is seen only in the experimental group, as indicated by the significant three-way interaction, $F(1,54) = 4.52$, $p < .05$.

On Test 2, results were similar to that on Test 1 except that there was no significant difference between familiar (trained) items ($M = 3.35$) and unfamiliar (transfer) items ($M = 3.16$), $F(1,54) = 1.97$. The other comparisons were as follows (all df's - 1,54):group: $F = 72.14$, $p < .001$; type of word: $F = 27.93$, $p < .001$; group by type of word: $F = 7.62$, $p < .01$; group by type of item: $F = 1.29$; type of word by type of item, $F = 10.73$, $p < .01$; the three-way interaction: $F = 16.19$, $p < .01$.

The relative difficulty of the familiar and unfamiliar items in the absence of specific training can be assessed by looking at the control group's performance. On Test 1, the items that had been selected as the transfer items were signficantly more difficult that the items selected to be the familiar items tested; on Test 2, there were no differences between the familiar and unfamiliar items.

The pattern of results is similar on both tests. The experimental group

performed significantly (and substantially) better than did the control group on the unfamiliar items as well as on the familiar items, indicating that transfer did occur and thus that the instructional program had succeeded in teaching strategies of decoding.

The experimental subjects did almost as well on nonsense material as on real words, whereas control subjects did much better on real words. This finding probably reflects (1) the fact that outside of the context of the program, it is unlikely that there was much work with nonsense material; and (2) the fact that the control subjects' performance was more likely to be based on their ability to read sight words and not to use decoding strategies.

The interaction between type of item and familiarity of item, because it appears only for the control group, is probably best ascribed to the specific features of the items chosen for the several conditions. The same pattern appears on both tests. That the experimental group's performance on nonsense words is, on both tests, and for both familiar and unfamiliar items, almost as good as its performance on real words corroborates the conclusion that the program teaches process skills.

CONCLUSIONS

The data indicate that children to whom the program was administered performed significantly better on a test of decoding than did control children. The fact that this superiority was demonstrated not only on words that had been used in instruction but also on novel words indicates that the instructed children acquired general decoding strategies. Moreover, the program was effective without a large investment in costly teacher training, teacher-aids, or other classroom support. These findings support the current interest in research on phonemic skills and the recommendations that these skills be emphasized in beginning reading instruction (Richardson, DiBenedetto, & Bradley, 1977; Golinkoff, 1978). The results of the work reported here suggest that as a component of a well-planned comprehensive reading program, The ABD's of Reading shows promise for use with rather severely learning-disabled children.

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Table 1

Mean Scores for all children (N=146) Initially Tested, Year 1

Subtest	Maximum Possible Score	Mean Number Correct	Standard Deviation
Syllable Analysis			
Compound words	2	1.82	.54
2-syllable words	2	1.79	.59
3-syllable words	2	1.39	.83
Syllable Blending			
Compound words	2	1.91	.48
2-syllable words	2	1.90	.44
3-syllable words	2	1.78	.58
Letter-Sound Correspondences			
Choosing the letter when phoneme is presented	15	13.08	2.73
Saying the phoneme when letter is presented	15	11.50	3.50
Phoneme Analysis			
Saying the initial phoneme	6	4.72	1.68
Saying the final phoneme	6	4.12	2.03
Saying the middle phoneme	6	2.92	2.35
Saying all 3 phonemes	6	2.66	2.19
Phoneme Blending			
Real words:			
CV-C	2	1.60	.64
C-VC	2	1.28	.80
C-V-C	2	.83	.83
Nonsense words:			
CV-C	2	1.10	.84
C-VC	2	1.01	.83
C-V-C	2	.77	.81
Decoding			
Bigrams			
Real words	2	1.25	.89
Nonsense	4	1.33	1.50
Trigrams			
Real words	6	2.54	2.08
Nonsense	6	1.67	1.95

Table 2

Means and (Standard Deviations) of Pretest Scores, Year 1

Subtest	Maximum Possible Score	All Children in Instructed Classes (N=146)	Instructed Children (N=51)	Comparison Children (N=51)	Second-Graders (N=36)
Syllable Analysis (Compound words, two- and three syllable words)	6	5.00 (2.65)	4.77 (2.62)	5.27 (2.70)	5.82 (2.82)
Syllable Blending (Compound words, two- and three-syllable words)	6	5.59 (2.79)	5.18 (2.65)	5.16 (2.65)	6.00 (0)
Letter-Sound Correspondences					
Choosing the letter when phoneme is presented	15	13.08 (2.73)	12.20 (3.05)	12.59 (2.62)	13.50 (2.14)
Saying the phoneme when letter is presented	15	11.50 (3.50)	10.20 (3.57)	10.43 (3.23)	12.08 (3.58)
Phoneme Analysis (CVCs)					
Saying the initial phoneme	6	4.72 (1.68)	4.59 (1.72)	4.88 (1.41)	5.33 (1.04)
Saying the final phoneme	6	4.12 (2.03)	3.27 (2.01)	3.47 (2.00)	5.08 (1.20)
Saying the middle phoneme	6	2.92 (2.35)	1.67 (2.10	2.71 (2.35)	4.67 (1.97)
Saying all three phonemes	6	2.66 (2.19)	1.41 (1.77)	1.51 (1.60)	4.22 (2.03)
Phoneme Blending (CV-C, C-VC, and C-V-C)	12	6.59 (3.19)	4.78 (2.66)	5.66 (2.92)	9.15 (3.89)
Decoding (Bigrams and trigrams, real and nonsense)	18	6.79 (4.55)	2.96 (2.00)	2.84 (2.17)	10.75 (6.04)

Table 3

Means and (Standard Deviations) of Posttest Scores, Year 1

Subtest	Maximum Possible Score	Immediate Posttest (June, 1976) Instructed Children (N=51)	Immediate Posttest (June, 1976) Comparison Children (N=51)	Delayed Posttest (January, 1977) Instructed Children (N=36)	Delayed Posttest (January, 1977) Comparison Children (N=36)
Syllable Analysis (Compound words, two- and three-syllable words)	6	5.18 (1.29)	5.39 (1.44)	4.92 (1.30)	5.31 (1.01)
Syllable Blending (Compound words, two- and three-syllable words)	6	5.65 (.82)	5.76 (1.34)	5.42 (1.25)	5.50 (.94)
Letter-Sound Correspondences					
Choosing the letter when phoneme is presented	15	14.25 (1.29)	13.59 (1.79)	14.50 (1.06)	14.36 (.93)
Saying the phoneme when letter is presented	15	13.73 (1.92)	11.63 (3.25)	13.08 (1.76)	12.58 (2.20)
Phoneme Analysis					
Saying the initial phoneme	6	5.16 (1.50)	5.35 (1.16)	5.44 (1.25)	5.03 (1.32)
Saying the final phoneme	6	4.92 (1.64)	4.55 (1.72)	5.39 (1.02)	4.33 (1.82)
Saying the middle phoneme	6	4.90 (1.87)	3.84 (2.12)	4.69 (1.98)	3.50 (2.36)
Saying all three phonemes	6	3.98 (2.03)	2.96 (2.27)	3.67 (2.03)	2.39 (2.10)
Phoneme Blending (CV-C, C-VC, and C-V-C)	12	9.04 (3.01)	7.84 (3.21)	8.31 (3.19)	6.67 (3.21)
Decoding (Bigrams and trigrams, real and nonsense)	18	11.70 (5.10)	6.33 (5.03)	10.53 (4.65)	7.88 (4.62)

Table 4

Means and (Standard Deviations) of Pretest Scores, Year 2

Subtest	Maximum Score	Experimental Ss N = 20 x 3	Control Ss N = 14 x 3
Letter-sound correspondences Saying phoneme when letter is presented	18	10.15 (4.62)	10.55 (3.39)
Phoneme Analysis (CVCs) Saying initial phoneme	6	3.57 (1.81)	3.10 (1.32)
Saying final phoneme	6	2.47 (1.69)	2.55 (1.49)
Saying middle phoneme	6	1.22 (1.27)	1.05 (.97)
Saying all 3 phonemes	6	.75 (.96)	.69 (.90)
Phoneme Blending (CVCs) CV-C	6	2.48 (1.09)	2.07 (.98)
C-VC	6	2.08 (1.45)	2.40 (1.28)
C-V-C	6	1.32 (1.43)	1.29 (1.08)
Decoding Trigrams (CVCs)	18	2.37 (1.96)	2.55 (1.65)

Table 5

Correlations among Pretest Scores, Year 2

Subscore	1	2	3	4
1. Phoneme analysis	--	.578	.817	.627
2. Phoneme blending		--	.528	.633
3. Letter-sound correspondences			--	.659
4. Decoding				--

Table 6

Means and (Standard Deviations) of Adjusted Posttest Scores, Year 2

Subtest	Maximum Score	Experimental Ss	Control Ss	F
Letter-sound correspondences Saying phoneme when letter is presented	18	14.33 (3.48)	12.18 (2.29)	3.97*
Phoneme Analysis (CVCs) Saying initial phoneme	6	4.79 (1.30)	4.44 (.85)	.79
Saying final phoneme	6	4.29 (1.48)	3.01 (.94)	7.79**
Saying middle phoneme	6	3.84 (1.57)	1.82 (1.14)	16.60**
Saying all 3 phonemes	6	2.86 (1.60)	1.25 (.81)	11.58**
Phoneme Blending (CVCs) CV-C	6	4.26 (1.21)	3.27 (1.13)	5.88*
C-VC	6	4.04 (1.39)	2.86 (.87)	7.71**
C-V-C	6	3.31 (1.57)	1.75 (.63)	11.90**
Decoding Trigrams (CVCs)	18	8.79 (4.18)	5.33 (2.82)	7.04**

* $p < .05$

** $p < .01$

df = 1,31

Table 7

Correlations among Selected Variables, Year 2

Variable	1	2	3	4
1. Total Pretest Score	----	.721	.349	-.403
2. Total Posttest Score		----	.654	-.006
3. Number of Units Completed			----	.262
4. Number of Sessions				----